Name: ______

____ / 25

There are 25 points possible on this quiz. No aids (book, calculator, etc.) are permitted. Show all work for full credit.

1. [9 points] Find the radius r and height h of the cylinder with surface area 24π that has the largest possible volume. The formulas for the volume V and surface area S are given below.

 $V = \pi r^2 h, \qquad S = 2\pi r^2 + 2\pi r h$

a. State the value that you want to maximize/minimize.

Volume (V)

b. Write the value from part (a) as a function of a single variable.

 $5 = 2 \pi r^{2} + 2 \pi r h$ $24\pi = 2\pi r^{2} + 2\pi r h$ $12 = r^{2} + r^{h}$ $h = \frac{12}{r} - r$

 $V = TTr^{2}h$ $V = TTr^{2}\left(\frac{12}{r} - r\right)$ $V = 12TTr - TTr^{3}$

c. Answer the original question and use calculus to justify your answer.

V=12TT-3TTr2

 $1277 - 377r^2 = 0$

r=2 (-2 is a solution, but r=2 (-2 is a solution, but loesn't make sense as a radius)

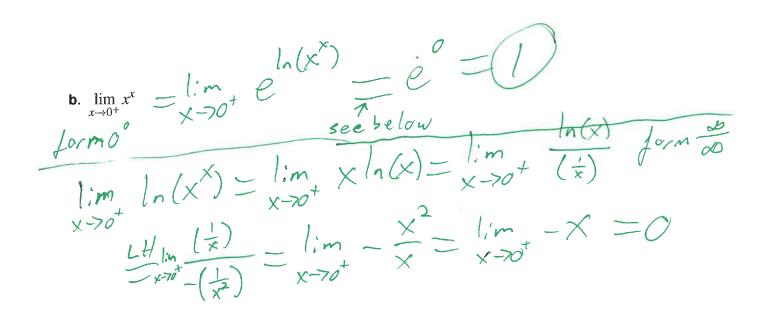
+ - (Second derivative

test works too)

hence max, not min

2. [8 points] Use L'Hôpital's Rule to evaluate the limits below. Indicate your use of L'Hôpital's Rule with $\stackrel{h}{=}$ or $\stackrel{L'H}{=}$ or something similar. (Be sure to verify explicitly that L'Hôpital's Rule applies!).

a.
$$\lim_{x \to 1^{+}} \frac{x + \cos(\pi)}{\ln(x)} \stackrel{LH}{=} \lim_{x \to 1^{+}} \frac{1}{\left(\frac{1}{x}\right)} = \lim_{x \to 1^{+}} \frac{1}{\left(\frac{1}{x}$$



3. [8 points] Evaluate the following antiderivatives (aka indefinite integrals).

points] Evaluate the following antiderivatives (aka indefinite integrals).

a.
$$\int (x^3 - 4e^x - \cos(x) + \ln(2)) dx = \frac{x^4}{4} - 4e^x - 5in(x) + x \ln(2) + C$$

b.
$$\int \frac{x^{3.6} + \sqrt{x}}{x^2} dx = \int \left(x^{1.6} + x^{-\frac{3}{2}} \right) dx$$
$$= \frac{x^{2.6} - x^{-\frac{1}{2}}}{2.6} = \frac{x^{2.6} - 2x}{(\frac{1}{2})} = \frac{x^{2.6} - 2x}{2.6}$$